Geophysical Research Abstracts
Vol. 12, EGU2010-13763, 2010
EGU General Assembly 2010

Reconstructing snow water equivalent in mountainous regions using remotely sensed data and distributed snowmelt models

Noah Molotch
(noah.molotch@colorado.edu)

Snow cover extent is one of the earliest land surface variables ever detected from space. While this information has been exploited to detect trends in snow cover, little effort has been made to utilize these data to estimate the distribution of snow water equivalent – the primary hydrologic variable of interest. To that end, I will present a methodology whereby time series of snow cover extent data from a variety of different orbiting satellites are combined with a spatially distributed snowmelt model to reconstruct snow water equivalent (SWE) at a variety of spatial scales. In this reconstruction approach, modeled snowmelt over each pixel is integrated over the time of satellite observed snow cover to estimate SWE. In recent years the technique has been used broadly to characterize spatio-temporal evolution of mountain SWE distribution across different parts of the globe, including the Sierra Nevada and Rocky Mountains of North America and the Central Andes of Chile. In these different applications the model adequately recovered SWE relative to detailed field measurements with a mean absolute SWE error ranging from 2 to 23% depending on the application. A key strength of the technique is that spatially distributed SWE estimates are not dependent upon ground-based observations. Moreover, the model is relatively insensitive to the location of forcing observations relative to commonly used statistical SWE interpolation models. Hence, the reconstruction technique is a viable approach for obtaining high-resolution SWE estimates at larger scales (e.g. > 1000 km2) and in locations where detailed hydrometeorological observations are scarce. Results which showcase the technique in a variety of different climatic regimes will be discussed as will implications for water resource management and ecosystem dynamics.